

AP Chemistry

Thermochemistry 2

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Name: _____

Date: _____ Period: _____

1. For the hypothetical reaction
 $3X_{2(g)} \rightarrow 2X_{3(g)}$, ΔH° is -333kJ (the atomic weight of X is 66.6amu). Determine ΔH of the conversion of 11.1g of X_3 gas into X_2 gas in kilojoules.

Answer: _____

2. Given
 $2Na_2O_{2(s)} + 2H_2O_{(l)} \rightarrow 4NaOH_{(s)} + O_{2(g)}$
 $\Delta H^\circ = -126\text{kJ}$
Calculate the amount of heat that is evolved (in kJ) from the reaction of 25.0g of Na_2O_2 with water.

Answer: _____

3. If the molar heat capacity of a compound with the formula C_2H_6SO is 88.0J/molK, what is the specific heat (in J/gK) of this substance?

Answer: _____

4. A sample of aluminum (0.90J/gK) absorbs 9.86J of energy while being heated from 23.2°C to 30.5°C. Determine the mass of the sample.

Answer: _____

5. An iron sphere of diameter 4.00cm and density 7.86g/cm³ at 20.0°C is dropped into a perfectly insulated beaker containing 90.0g of H_2O at 50.0°C ($V = 4/3\pi r^3$). The specific heats of Fe and H_2O are 0.45 and 4.18J/gK, respectively. What is the final temperature (in °C) of the iron sphere?

Answer: _____

6. When 50.0mL of 1.00M HCl is mixed with 50.0mL of 1.00M NaOH (both at 23.0°C), the resulting solution increases in temperature to 29.8°C. Assuming that the solution has the density and specific heat of pure water, calculate the enthalpy of the reaction.

Answer: _____

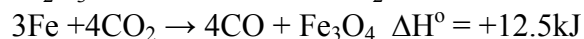
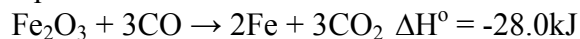
7. A 1.96g sample of titanium was burned in a bomb calorimeter that had a heat capacity of 9.84kJ/K. The temperature of the calorimeter increased from 36.84°C to 98.82°C. Calculate the heat (kJ) that is released from the combustion of one mole of titanium.

Answer: _____

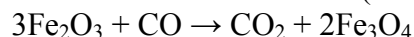
8. The heat of solution (ΔH_{soln}) for sodium hydroxide is 44.4kJ/mol. If a 13.9g sample of NaOH dissolves in 250.g of water at 23.0°C, what will the final temperature of the solution be? Assume that the solution has the same specific heat as water.

Answer: _____

9. Consider the following thermochemical equations:

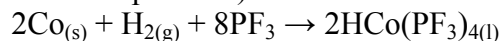


Calculate the value of ΔH° (in kJ) for



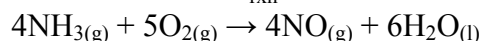
Answer: _____

10. For which of the species in the reaction below is the ΔH°_f equal to zero (more than one choice is possible)?



Answer: _____

11. Calculate $\Delta H^\circ_{\text{rxn}}$ for



given

Substance	ΔH°_f (kJ/mol)
$\text{H}_2\text{O}_{(l)}$	-286
$\text{NO}_{(g)}$	90
$\text{NH}_{3(g)}$	-46

Answer: _____

12. Given that silver has a specific heat of $0.235\text{J/g}^\circ\text{C}$, what is this value in $\text{cal/g}^\circ\text{C}$? If a 75.0g sample of silver at $100.^\circ\text{C}$ is dumped into a calorimeter containing $100.\text{g}$ of water at 20.0°C , what will be the final temperature of the system at equilibrium? How much heat energy is transferred to the water in joules?

Answer: _____

Answer: _____

Answer: _____

13. A sample of a block of metal measuring $1.351\text{cm} \times 10.00\text{cm} \times 1.000\text{cm}$ (and density = 7.874g/cm^3) at $100.^\circ\text{C}$ is placed into a coffee cup calorimeter containing $100.\text{g}$ of water at 22.0°C . If the final temperature of the system is 30.0°C , determine which of the following metals the sample is likely to be.

Substance	Specific heat ($\text{J/g}^\circ\text{C}$)
Aluminum	0.902
Iron	0.449
Lead	0.128
Silver	0.235

Answer: _____

14. A 55.0g sample of water at 69.0°C is added to an unknown amount of water at 22.0°C . The final temperature is 31.0°C . How many grams of water were there initially at 22.0°C ?

Answer: _____